Worksheet 1: Practice Problems in Prevalence and Incidence (Teacher's Answer Key)

Name Mr. Bradley Health Medicine Epidemiology

Directions: Using the definitions of incidence and prevalence given previously, answer the following questions. Be sure to show your work.

1. Spring fever! Epidemiologists and teachers alike have noticed the cyclic occurrence of the dreaded spring fever. Students afflicted with this disease exhibit certain listlessness in class, and they seem to stare out the windows with remarkable tenacity. Why, it's almost as if the trees growing outside are more interesting than doing algebra. (Gasp!)

At Metropolitan High School, teachers have been monitoring the situation and diagnosing spring fever. Their observations began with week 0, the first week in May. The teachers' data are shown in the following table:

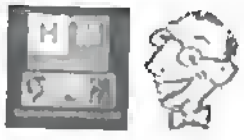
incidence = new cases

prevalence = # of ss

Spring Fever Cases: Raw Data

Week	Newly Diagnosed with SF	No SF Diagnosed
0	0	1,025
1	105	920
2	180	740
3	390	350
4	325	25

a. For weeks 1–4, calculate the prevalence and incidence rates, and express them as decimals.



(2)

Spring Fever: Incidence and Prevalence Rates

New Cases = Incidence Rate

Cases so far = Prevalence Rate (increasing)

Week	New Cases	Total Cases So Far	Individuals at Risk at Start of Week	Weekly Incidence Rate	Prevalence Rate
1	105	105	1,025	105/1025 = 0.102	0.102 = 105/1025
2	180	285	920	180/920 = 0.196	0.278 = 285/1025
3	390	675	740	390/740 = 0.527	0.659 = 675/1025
4	325	1,000	350	325/350 = 0.929	0.976 = 1000/1025

b. From your data above, convert the incidence and prevalence rates to rates per 100 and fill in the table below with your answers. (Note that week 1 is the first row of changes where calculations should be made.)

Spring Fever: Incidence and Prevalence Rates per 100

×100 ×100

Week	Weekly Incidence Rate per 100	Prevalence Rate per 100
1	.102 ×100 = 10.2	.102 ×100 = 10.2
2	.196 ×100 = 19.6	.278 ×100 = 27.8
3	.527 ×100 = 52.7	.659 ×100 = 65.9
4	.929 ×100 = 92.9	.976 ×100 = 97.6

c. Consider the incidence rates you have calculated. Based on these data, when should teachers expect the greatest increases in spring fever?

Week 4 has the highest incidence rate.

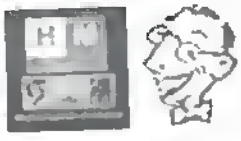
2. Diphtheria. Diphtheria is a disease caused by bacteria, and it usually affects the tonsils, throat, nose and/or skin. It is passed from person to person via coughing or sneezing, but it can also be spread by drinking from a glass used by an infected person. In 1878 Sir William H. Powers was investigating an outbreak of diphtheria in Kilburn and St. Johns Wood in England. As part of his early epidemiologic detective work, Powers noticed that if he drew two concentric circles at a particular point—one with a radius of a half-mile, one with a radius of one mile—an interesting pattern to the disease emerged. He studied the data for the inner circle and the outer ring. Here are his data for 15 weeks of observation:

(3)

The Incidence of Diphtheria: 1878 England

Week Ending	Inner Circle: Number of Households Newly Attacked	Outer Ring: Number of Households Newly Attacked
March 9	1	1
March 16	4	1
March 23	2	0
March 30	4	1
April 6	0	2
April 13	0	2
April 20	2	0
April 27	5	1
May 4	8	2
May 11	7	0
May 18	41	5
May 25	14	1
June 1	5	3
June 8	3	0
June 15	2	1

a. There were 700 houses in Powers's inner circle and 2,700 in the outer circle (for a total of 3,400). Using the end of the week of March 2 as zero time, calculate the incidence rates for these 15 weeks in the inner and outer circles. Show your results in the table below.



Incidence Rates for the Circles

Week Ending	Inner Circle: Number of Households Newly Attacked	Inner Circle Number of Households Still at Risk	Inner Circle: Incidence Rate	Outer Ring: Number of Households Newly Attacked	Outer Ring: Number of Households Still at Risk	Outer Ring: Incidence Rate
March 2	0	700	—	0	2,700	—
March 9	1	699	1/700	1	2,699	1/2,700
March 16	4	695	4/699	1	2,698	1/2,699
March 23	2	693	2/695	0	2698	0/2698
March 30	4	689	4/693	1	2697	1/2697
April 6	0	689	0/689	2	2695	2/2697
April 13	0	689	0/689	2	2693	2/2695
April 20	2	687	2/689	0	2693	0/2693
April 27	5	682	5/687	1	2692	1/2693
May 4	8	674	8/682	2	2690	2/2692
May 11	7	667	7/674	0	2690	0/2690
May 18	41	626	41/667	5	2685	5/2690
May 25	14	612	14/626	1	2684	1/2685
June 1	5	607	5/612	3	2681	3/2684
June 8	3	604	3/607	0	2681	0/2681
June 15	2	602	2/604	1	2680	1/2681

b. Make two graphs from your data. (The week ending March 2 = 0.)

i. A line plot of the incidence rate per week for the inner circle versus the week number.

ii. A line plot of the incidence rate per week for the outer ring versus the week number.

From your graphs, how would you describe the pattern of incidence of diphtheria?

There is a spike of incidence in mid-May, suggesting a specific cause rather than an environmental factor. (It turns out that the milk supply from a particular dairy was the culprit!)

3. Autism. Autism is a serious and lifelong disability that is characterized by a severely decreased ability to engage in communication and social interaction. In 1998 citizens in a New Jersey town were concerned about the number of children diagnosed with autism, and a study was undertaken to establish the prevalence in the community. The citizens were concerned about possible environmental factors that might be causing the autism, as well as establishing an appropriate level of educational and social services for the autistic children.

Data from this study are reported below:

Numbers of Children Diagnosed with Autistic Disorder

Age Category (y)	Diagnosed with Autistic Disorder	Number of Children in Population
3–5	19	3,479
6–10	17	5,417

a. Calculate the prevalence rate of autism for these children for the two age categories.

For ages 3–5: 0.00546 19/3479 = .00546

For ages 6–10: 0.00313 17/5417 = .00313

b. Convert the prevalence rate to a rate per 1,000.

For ages 3–5: 5.46 per thousand x1000 = 5.46

For ages 6–10: 3.13 per thousand x1000 = 3.13